# Extrinsic tracheostomy tube compression in a patient with upper airway obstruction Case Reports

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## Introduction

Tracheostomy tubes are made of various synthetic materials and have varying degrees of rigidity and compressibility, depending on the material by which they are constructed.
Recent material alterations to commonly used tracheostomy tubes have resulted in more compressible tubes.

We present two cases of external tracheostomy tube compression resulting in partial tube obstruction in the post-operative period. Understanding the factors contributing to this complication is important in knowing how to prevent it, identify it and treat it.

## Learning Objectives

- Following this presentation, attendees will:
- Describe measures taken when an extrinsic tracheotomy tube compression is identified with unknown cause.
- Highlight a potential risk of increased flexibility inherent in the design of newer tracheotomy tubes.
- Review tracheostomy tube malfunctions and complications.

## Literature Review

No English publications were found involving extrinsic compression of a tracheostomy tube from an unknown etiology.

## Case presentations

Case 1:

- patient presented with a 24 hour history of acute onset of significant submandibular and submental swelling, with vallecular and epiglottic edema on flexible fiberoptic nasopharyngolaryngoscopy [Figure 1]
- initially uncomplicated awake tracheotomy was performed between the first and second tracheal rings for insertion of a #6 Shiley cuffed, non-fenestrated tracheostomy tube [Figure 2]
- In immediate post-operative period, it was identified that a suction catheter could not be passed down the tracheostomy tube
- the inner cannula was removed and then could not be reinserted
- bronchoscopy was then performed at the bedside and identified a 40% to 50% occlusion of the tracheostomy tube as a result of the tube itself being compressed externally [Figure 2 and 3]
- secondary causes such as external compression from vascular rings, goiter, osteophytes, and esophageal disorders were ruled out [Figure 4]
- returned to the operating room to widen the tracheotomy incision for troubleshooting purposes
- new #6 Shiley tracheostomy tube was placed into the tracheotomy incision in a smooth pass
- bronchoscopy was repeated and the same issue of airway compromise was identified due to external compression and narrowing of the tracheostomy tube
- tube was removed and a limited anterior tracheal ring excision inferior to the tracheotomy incision was performed
- new # 6 Shiley tracheostomy tube was inserted, and bronchoscopy showed no lumen narrowing of the tube

*Figure 1.* Axial Computerized tomography scan demonstrating epiglottic edema and submandibular swelling.

*Figure 2.* Shiley™ Tracheostomy Tube, Cuffed w/ Inner Cannula (LPC), Non-Fenestrated

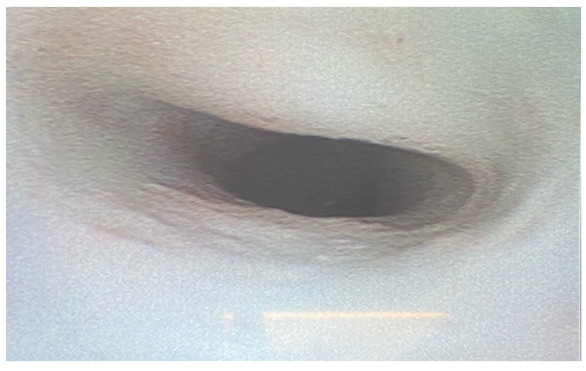

*Figure 3.* Image during bronchoscopy from within the tracheostomy tube showing external compression of the tracheostomy tube

*Figure 4. Sagittal Computerized tomography scan of the tracheal passage showing no esophageal or osteophyte cause for compression of the airway .*

Case 2:

- patient presented with a large obstructing pharyngeal mass, and was taken for an awake tracheostomy using a #6 Shiley cuffed, non-fenestrated tracheostomy tube and biopsy
- post-operatively, a suction catheter was unable to pass, thus the inner cannula was removed and could not be reinserted
- bronchoscopy at the bedside was performed and it revealed a 20% compression of the tracheostomy tube significant force then allowed the inner cannula to be replaced, and 8Fr suction catheters were used for suctioning

Following this event, the tracheostomy tube change was difficult but uneventful. There was no further compression noted on repeat bronchoscopy.

It was thought that the extrinsic compression was due to impingement between the patients' tracheal rings. Notably, the laryngotracheal cartilages were grossly normal otherwise.

## Conclusion

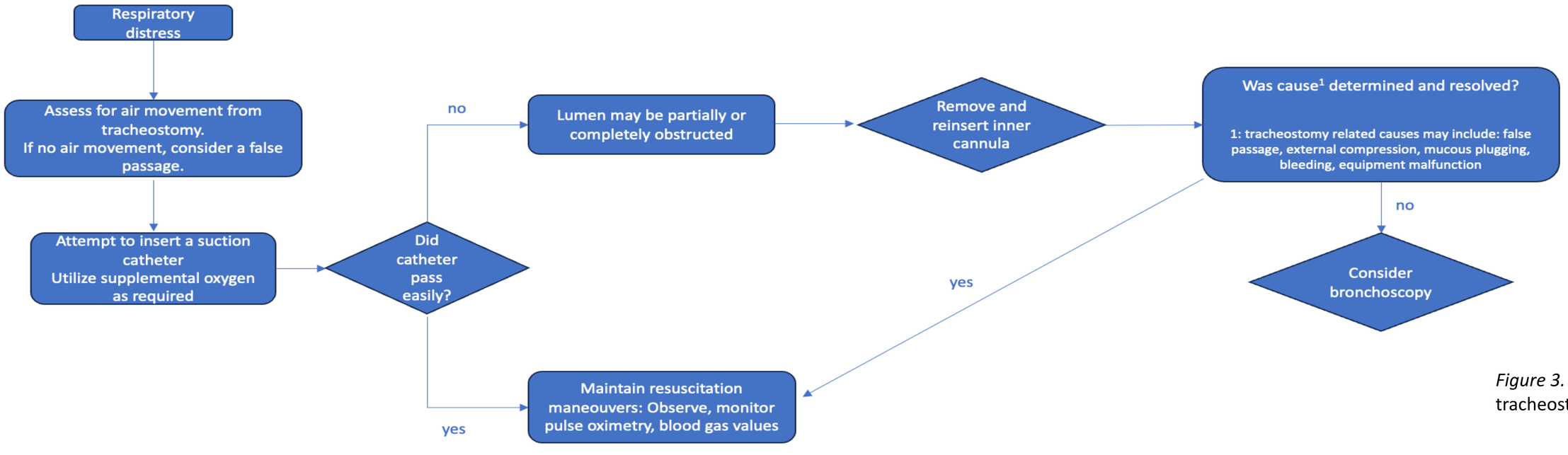


*Figure 3.* Algorithm for managing tracheostomy complications.

- failure of equipment is a difficult problem to resolve if the cause of the problem has not been identified previously
- important to consider that tracheostomy tubes are made from various materials and therefore have a range of stiffness
- commonly used contemporary tracheostomy tubes being soft and malleable, compression of the tube lumen by the tracheal rings is prone to happen.
- currently, no explicit protocol or predictive model is in place to anticipate the situation and no comprehensive strategy is available for assessing critical medical devices
- when facing tracheostomy tube complications, an algorithm for managing them can be used to identify the specific issue [Figure 3]

We propose that equipment malfunction be incorporated into the algorithms that exist alongside the possible complications that can occur with tracheostomies, to facilitate management when physicians encounter similar complications. For example, the utilization of bedside bronchoscopy was crucial in identifying the tracheostomy tube compression in our two cases.

Please contact the presenter for appropriate references. The authors declare no conflicts of interest.